

SSVEO IFA List

Date:02/27/2003

STS - 45, OV - 104, Atlantis (11)

Time:04:15:PM

<u>Tracking No</u>	<u>Time</u>	<u>Classification</u>	<u>Documentation</u>	<u>Subsystem</u>	
MER - 0	MET: Prelaunch	Problem	FIAR	IFA STS-45-V-01	MPS
None	GMT: Prelaunch		SPR	UA	Manager:
			IPR 45V-0138	PR	Engineer:

Title: MPS LH2 Leak During First Launch Attempt (ORB)

Summary: DISCUSSION: During the first STS-45 launch attempt, the aft compartment H2 concentration began a rapid rise when fast fill operation began. The concentration reached a value of 750 ppm approximately 3.5 minutes into fast fill, above the LCC limit of 500 ppm, when LH2 fill was terminated. This exceedance along with an LO2 LCC violation (STS-45-V-02) resulted in a launch scrub. Before detanking, leak isolation tests were performed which were unable to duplicate the leak. Fast flow was reinitiated and the aft H2 concentration stabilized at a maximum of 140 ppm, after which it then decreased to approximately 60 ppm. Detanking was then accomplished.

During the second launch attempt tanking operations, the time of the initial LH2 slow fill operation was extended to watch for leaks during LO2 fill operations. This gave the LH2 components a longer-than-normal time at cryogenic temperatures before fast fill operations were initiated. When normal LH2 loading operations were resumed, the maximum H2 concentration achieved was 280 ppm. Post-flight analysis of the aft compartment in-flight gas sample bottles showed normal H2 concentrations. The inability to repeat the magnitude of the H2 leak during the first attempt's leak isolation tests as well as the second launch attempt is attributed to the thermal gradient to which the LH2 umbilical hardware is exposed during chilldown. This thermal gradient is a transient condition which causes temporary distortion of the disconnect/seal fit as the materials chill to cryogenic temperatures. As thermal equilibrium is achieved material distortion, as well as cryogenic leakage, decreases. This condition stabilizes during continued exposure to cryogenic fluid. CONCLUSION: The high aft-compartment H2 concentration observed during the first launch attempt was most probably caused by a temporary thermal distortion of the LH2 umbilical hardware sealing surfaces during the initial phase of LH2 tanking. By exposing these surfaces to a long cryogenic conditioning time, the leak concentration during subsequent fill operations was reduced. CORRECTIVE_ACTION: The prelaunch LH2 loading procedures have been modified to allow a longer chilldown period of the disconnect/seal hardware. Specifically, the slow fill period will be extended until the ET 5 percent sensors show a wetted condition. Previously, termination of slow fill and start of fast fill was based on the engine cut-off sensors indicating wet (<2 percent ET quantity loaded). This change allows approximately 20 additional minutes of thermal stabilization. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

<u>Tracking No</u>	<u>Time</u>	<u>Classification</u>	<u>Documentation</u>	<u>Subsystem</u>
MER - 0	MET: Prelaunch	Problem	FIAR	IFA STS-45-V-02
None	GMT: Prelaunch		SPR	UA
			IPR 45V-0139	PR
				Manager:
				Engineer:

Title: MPS O2 Leak During First Launch Attempt (ORB)

Summary: DISCUSSION: During the first STS-45 launch attempt, the aft compartment oxygen (O2) concentration rose rapidly after slow fill operations began to a maximum of approximately 860 ppm. The maximum allowable is 500 ppm. LO2 flow continued while a hydrogen concentration exceedance (IFA STS-45-V-01) anomaly was investigated. These two anomalies resulted in a launch scrub. Over the next 7 minutes, the O2 concentration decreased until holding steady at approximately 200 ppm. At this point, fast fill was initiated and continued until the tank was roughly half full. The O2 concentration remained around 200 ppm, however. Detanking operations then began, during which leak isolation tests were unable to duplicate the leak.

Based on review of the first tanking data, a decision was reached prior to the second loading that the loading would continue for a temporary LCC violation if the value stabilized below the LCC limits. The O2 concentration during the second ET loading peaked at 1128 ppm, but decreased to a stable value of less than 200 ppm. Although this peak value was higher than expected, it is attributed to a sealing surface configuration change between loadings caused by a cycling of the 17 inch disconnect flapper valve. Post-flight analysis of the aft compartment in-flight gas sample bottles showed normal O2 concentrations. The inability to repeat the O2 leak during the first attempt's leak isolation tests as well as the leak's rise and decline behavior during the second loading is attributed to the thermal gradient to which the LO2 umbilical hardware is exposed during loading. This thermal gradient is a transient condition which causes temporary distortion of the disconnect/seal fit as the materials chill to cryogenic temperatures. As thermal equilibrium is achieved, material distortion, as well as cryogenic leakage, decreases. This condition stabilizes during continue exposure to cryogenic fluid. **CONCLUSION:** The high aft-compartment O2 concentrations observed during the two launch attempts were most probably caused by a temporary thermal distortion of the LO2 umbilical hardware sealing surfaces during the initial phase of LO2 tanking. The leak concentrations reduced during continuing fill operations as the sealing surfaces became thermally stabilized at cryogenic temperatures. **CORRECTIVE_ACTION:** The Launch Commit Criteria were modified to state that temporary aft compartment concentration limit exceedances which later return to and remain within limits are allowable.

EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

<u>Tracking No</u>	<u>Time</u>	<u>Classification</u>	<u>Documentation</u>	<u>Subsystem</u>
MER - 0	MET: Prelaunch	Problem	FIAR	IFA STS-45-V-03
None	GMT: Prelaunch		SPR 45RF01	UA
			IPR 46V-0002	PR
				Manager:

Engineer:

Title: APU 3 Z-axis Vibration sensor Failed (V46D0381A) (ORB)

Summary: DISCUSSION: Upon activation of auxiliary power unit (APU) 3 (serial number 307), the Z-axis accelerometer (V46D0381A) read off-scale low and remained in that condition for the entire mission. Further data review indicated that this measurement was off-scale low upon vehicle power-up, but showing a small amplitude of noise. The small noise trace was present during the entire mission.

CONCLUSION: Troubleshooting revealed the signal conditioner and the accelerometer were working properly. A short was discovered in the coaxial cable at terminal "B" of connector 50V77W201P3. The pin was replaced, the coaxial cable was reterminated, and a functional checkout of the vibration monitoring system was performed successfully. CORRECTIVE_ACTION: The wire was repaired and a functional checkout was performed with positive results. This problem is closed and is being tracked by CAR 45RF01-010. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

<u>Tracking No</u>	<u>Time</u>	<u>Classification</u>	<u>Documentation</u>	<u>Subsystem</u>
MER - 0	MET: Prelaunch	Problem	FIAR	IFA STS-45-V-04
EGIL-01	GMT: Prelaunch		SPR 45RF02	UA
			IPR 46V-0003	PR FCP-4-12-0145

Engineer:

Title: Fuel Cell 3 CPM Had Extended Self-Test (ORB)

Summary: DISCUSSION: The fuel cell 3 cell performance monitor (CPM) is designed to perform a 2.4 second self-test function every 7 minutes. About 1.5 hours into the mission, however, the fuel cell 3 CPM began remaining at the self-test value for approximately 3.5 minutes before returning to normal operations. After approximately 3.5 minutes, the extended self-test would again occur. This anomalous behavior lasted for about 2 hours, then normal operation returned. On flight day 2, the anomaly repeated for about three hours, after which nominal operation was experienced for the remainder of the flight.

The CPM measures the difference in voltage between the two halves of a 32-cell substack (three substacks per fuel cell) and is used to detect individual cell performance problems. The self-test circuit opens normal inputs and applies a 50 mV input signal to check that the output is 50 mV. The CPM circuitry for delta voltage measurements and self-test are separated to preclude interaction, therefore, the delta voltage readings were accurate when not overridden by the self-test. Analysis of the problem has determined the most probable cause to be a leaking capacitor or an open resistor within the CPM circuitry. The CPM was removed and is undergoing failure analysis at the vendor. CONCLUSION: The anomalous CPM self-test behavior was most probably caused by a component problem within the CPM circuitry.

CORRECTIVE_ACTION: The CPM was removed and replaced. EFFECTS_ON_SUBSEQUENT_MISSIONS: None. In the event of a CPM failure, fuel cell health can be monitored by performing a bus tie with a non-suspect fuel cell and monitoring for any current difference between the two fuel cells (current should be equal).

<u>Tracking No</u>	<u>Time</u>	<u>Classification</u>	<u>Documentation</u>		<u>Subsystem</u>
MER - 0	MET: 000:07:27	Problem	FIAR	IFA STS-45-V-05	APU
MMACS-01	GMT: 084:20:41:00.000		SPR 45RF03	UA	Manager:
			IPR 46V-0001	PR	Engineer:

Title: APU 1 GG Bed Heating System B Erratic (ORB)

Summary: DISCUSSION: Upon heater activation by the crew following ascent, the gas generator (GG) B heater system did not function. The GG bed temperature measurement (V46T0122A) indicated approximately 220 °F when the heater was selected. Since the GG bed temperature was below the 360 °F lower set point of the control circuit, the heater should have cycled and the temperature should have increased to the cutoff point of 425 °F. When the heater was selected, the GG bed temperature continued to decrease indicating a failed-off heater.

During this same time period, the auxiliary power unit (APU) 1 fuel line heater system (FP/GGVM) also failed to respond. When the heaters were first selected, the fuel system temperature was about 100 °F, which is above the thermostat set point of 73 °F. The B system heaters were left on until the GG bed temperature dropped to 140 °F and the fuel system temperatures dropped to 80 °F. At this time, the A heater system was selected and the GG bed temperature began to rise immediately and the heater cycled nominally. The fuel system heaters continued to show no response. After a 4 hour period, the fuel system temperatures decreased to 76 °F, at which time the heaters began to cycle. A few hours later, the heater system was reconfigured back to the B system to determine its status. After the B system was reselected, the GG bed temperature decreased from 400 °F to 385 °F and then began to rise to 430 °F indicating heater activation. The fuel system heater cycled at the same time as the GG bed heater. The GG bed temperature then decreased to 260 °F (indicating a failed off condition), and then a short cycle to 300 °F was experienced. Again, this GG bed heater cycle was at the same time as a fuel heater cycle. The GG bed temperature dropped to 210 °F and then cycled up to 450 °F during the next fuel system (FP/GGVM) heater cycle. Following this occurrence, both heater systems appeared to operate normally. On flight day 6, the B system GG bed heater failed off intermittently three times over a 6 hour period. A few hours later, the heater system was reconfigured back to the A system for the remainder of the mission, and no other anomalous conditions were noted. CONCLUSION: Troubleshooting at KSC resulted in the heater failing off after 4 cycles. Additional KSC troubleshooting was performed on April 23, 1992, and the flight problem was repeated. A visual inspection was performed on the APU wire harness for the GG and fuel system heaters. A small segment of the exposed wire was found in the fuel system heater wiring just upstream of the controlling thermostat (S17B). The exposed segment was located near a wire harness clamp. The location of the wire and clamp such that electrical arcing occurred from the wire to the clamp resulting in an intermittent short-to-ground condition. This effected both the GG and fuel system heaters due to the location of the short in the wiring system. CORRECTIVE_ACTION: The damaged segment of the wire was cut out and the was respliced. Teflon tape was also wrapped around the wire to prevent this failure from recurring. A functional checkout of all the APU heater systems has been successfully completed. This problem is closed and is being tracked by CAR 45RF03-010. EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

<u>Tracking No</u>	<u>Time</u>	<u>Classification</u>	<u>Documentation</u>	<u>Subsystem</u>
MER - 0	MET: 001:13:01:20.009	Problem	FIAR A. B-FCE-029-	GFE, C&T
INCO-06	GMT: 086:02:15:00.000		IFA STS-45-V-06	
			F049, B. B-FCE-029-F050, UA	Manager:
			C. B-FCE-029 PR	
			SPR	Engineer:
			IPR A. NoneB. NoneC.	
			None	

Title: A. CCTV Camera A Quality Poor. B. CCTV Camera C Noisy Video.C. CCTV Camera D Performance Poor. (GFE)

Summary: DISCUSSION: A. The crew reported degraded performance on closed-circuit TV (CCTV) camera A that caused the picture quality to become very poor (fuzzy). Troubleshooting was performed by ground controllers and the degraded performance was observed at 086:03:45 G.m.t. The camera later recovered. The poor picture quality output by CCTV camera A remained intermittent throughout the flight. The camera was removed from the vehicle and returned to Boeing FEPC.

B. The CCTV camera C downlink video was intermittently noisy, containing colored noise lines across the image. The camera later recovered. A burn spot on the CCTV camera C video image was noticed on the upper left part of the picture. The camera was not immediately removed from the vehicle so that trouble-shooting of the Ku-Band antenna system could be supported. The camera will be returned to Boeing FEPC for analysis and troubleshooting after its removal from the vehicle. C. The crew reported that CCTV camera C seldom worked in low light. This observation was not noticed by ground controllers. The crew also reported occasional problems controlling the pan and tilt of the camera. The problems could not be reproduced on the ground. There have been similar camera control problems on OV-104 with another camera installed in the CCTV camera D position, however, these control problems have not been duplicated during ground checkout. CONCLUSION: A. The problems encountered in-flight could not be reproduced on the ground. Additional testing will be performed at the vendor. B. The results of the troubleshooting performed on the camera will be documented with the closure of the FIAR for CCTV camera C. C. The low-light problems appear to be a subjective judgement of the camera's operation by the crew as these problems were not reproduced by ground controllers and operations personnel either during the flight or during postflight testing. The camera control problems do not appear to be related to the camera as similar problems have been observed during ground operations using a different camera. The most likely source of the control problem is the remote control unit. CORRECTIVE_ACTION: A. A different camera will be installed in position A for STS-46. The camera has been shipped to the vendor for additional analysis which will be documented when the FIAR for this camera is closed. B. A different camera will be installed in position C for STS-46. C. A different camera will be installed in position D for STS-46. The STS-45 camera D has been tested, returned to flight status, and is currently installed on the Tethered Satellite System (TSS) pallet for use on the STS-46 mission. The control problem is manageable, and control can be regained by cycling power to the camera. Normal ground checkout procedures will be performed on the CCTV camera D remote control unit. FIAR No: A. B-FCE-029-F049 B. B-FCE-029-F050 C. B-FCE-029-F051 EFFECTS_ON_SUBSEQUENT_MISSIONS: A. None. B. None. C. The crew may be required to cycle power to regain control of the CCTV camera D during the STS-46 mission.

<u>Tracking No</u>	<u>Time</u>	<u>Classification</u>	<u>Documentation</u>	<u>Subsystem</u>
MER - 0	MET: 001:03:10:20.009	Problem	FIAR	IFA STS-45-V-07
INCO-01, INCO-04	GMT: 085:16:24:00.000		SPR 45RF04	UA
			IPR 46V-0008	PR
				Engineer:

Title: a) Ku-Band Antenna Loss of Track In Acquisition Modeb) Ku-Band RF Power Out Intermittent Fail (ORB)

Summary: DISCUSSION: The Ku-Band system experienced angle tracking problems and erroneous power monitor telemetry indications in the communications mode. This problem was similar to the intermittent angle tracking problem seen on STS-37 with the same set of hardware. STS-37 was the first flight of this Deployed Assembly (DA) S/N 107. Subsequent to STS-37, DA S/N 107 also experienced power monitor problems on STS-43 and STS-44.

CONCLUSION: Postmission troubleshooting at KSC duplicated the angle tracking problem in both the communications mode and the radar mode, and the failure was isolated to the DA. The power monitor telemetry problem was intermittent and will be further investigated during failure analysis at the vendor.

CORRECTIVE_ACTION: DA S/N 107 was removed from OV-104 and replaced with DA S/N 102. DA S/N 107 will be returned to the vendor for further troubleshooting and repair. Further analysis and corrective actions will be tracked by CAR's 37RF04, 43RF05, 45RF04 and IPR 46V-0008.

EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

<u>Tracking No</u>	<u>Time</u>	<u>Classification</u>	<u>Documentation</u>	<u>Subsystem</u>
MER - 0	MET: Postlanding	Problem	FIAR	IFA STS-45-V-08
None	GMT: Postlanding		SPR 45RF05	UA
			IPR	PR STR-4-12-2504
				Engineer:

Title: Damage on Right RCC Panel #10 (ORB)

Summary: DISCUSSION: The postlanding debris inspection of OV-104 (Atlantis) discovered damage to the right-hand (R/H) reinforced carbon-carbon (RCC) panel #10. Two impact damage sites were found on the upper surface of panel #10. The largest damage site measured 1.6 inches by 1.9 inches and the second damage site measure 0.4 inch by 1 inch. Coating was missing from the damage sites and some substrate could be seen. The delamination boundaries for both damage sites have been determined by eddy current.

CONCLUSION: Rockwell performed low-velocity (8 to 16 feet per second) impact test with their results indicating that low-velocity oblique impacts produce delaminations similar to the panel #10 impacts. The impact direction has been implied by Rockwell from their low velocity tests and the small panel impact. The impact direction at the small damage site is believed to be aft to forward. The impact direction of the large site is parallel to the small impact site and probably aft to forward. Rockwell's analysis of the impact sites indicates that both impact sites contain stainless steel. The large site also contains aluminum and the small site also contains titanium. Aluminum, stainless steel, and copper were found near the impact sites. Rockwell has completed the majority of their testing and analysis and has determine the most probable cause of the impact damage was debris on-orbit or during entry. JSC Engineering has not ruled out prelaunch or ascent debris as being the cause of the damage. **CORRECTIVE_ACTION:** JSC Engineering has obtained the two impact samples of panel #10 to perform testing and analysis. JSC Engineering's conclusion from the upcoming analysis and testing will be documented in CAR 45RF05-010. RCC panel #10 has been replaced by a new panel and all RCC components are acceptable for flight. **EFFECTS_ON_SUBSEQUENT_MISSIONS:** None. Hazard ORBI 249B, Structural Overheating Caused by TPS Damaged/Failure is still valid for potential impacts during all phases of flight.

<u>Tracking No</u>	<u>Time</u>	<u>Classification</u>	<u>Documentation</u>	<u>Subsystem</u>
MER - 0	MET:	Problem	FIAR	IFA STS-45-V-09
None	GMT:		SPR 45RF06	UA
			IPR 46V-0012	PR
				Manager:
				Engineer:

Title: Inertial Measurment Unit 2 Z-Axis Accelerometer Bias Shift (ORB)

Summary: DISCUSSION: Sone after orbit was achieved during the STS-45 mission, the high accuracy inertial navigation system (HAINS) inertial measurement unit (IMU) 2 (HAINS S/N 203) exhibited a 4 sigma (120 micro-g) Z-axis accelerometer bias error. This error remained stable for 4.5 hours, at which time the IMU was commanded to "Standby" as part of the group B powerdown. When powered up for entry, IMU 2 still displayed the 120 micro-g bias error. The error was subsequently corrected by uplink of an updated bias value which was used for the remainder of the mission. On-orbit, because the accelerometers sense zero g, bias errors are easily observed and corrected via uplink. Both KT-70 and HAINS units typically exhibit accelerometer bias errors between the ground calibration and on-orbit. The errors are caused by accelerometer attitude sensitivity which corrupts the Hangar Calibration A (HCA) acceleration measurements performed on the launch pad.

During the HCA, the cluster is positioned to 13 different attitudes to cause precise g input levels to the accelerometer. At each attitude, in addition to sensing a specific g input, the acclerometers also sense thermal gradients and magnetic fields within the gimballed system. The net effect is that the acceleration measurement outputs are "contaminated", thus degrading calibration accuracy. Another HCA was performed on IMU S/N 203 on 4/17/92. This HCA showed that the bias was still at the "ground" calibration level, thus reaffirming that attitude sensitivity caused the error. **CONCLUSION:** Accelerometer attitude sensitivity is the most likely cause of the error. The magnitude of S/N 203's error is outside the current HAINS specifications but is considered acceptable for flight. **CORRECTIVE_ACTION:** For future flights, the error will be corrected in-flight by uplinking an on-orbit determined zero-g bias value. No other actions will be taken unless the bias becomes unstable. However, since the

ground vs on-orbit bias error of other HAINS units is unknown, only one new HAINS unit should be flown at a time, until the bias characteristics of all the flight HAINS IMUs are determined. In the unlikely event of a HAINS unit having a much larger bias error, this action will minimize any negative effects during ascent.

EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

<u>Tracking No</u>	<u>Time</u>	<u>Classification</u>	<u>Documentation</u>		<u>Subsystem</u>
MER - 0	MET: 008:21:46:20.009	Problem	FIAR	IFA STS-45-V-10	HYD
None	GMT: 093:11:00:00.000		SPR 45RF09	UA	Manager:
			IPR	PR	
					Engineer:

Title: Water Spray Boiler 1 Overcooling on B Controller (ORB)

Summary: DISCUSSION: Water spray boiler (WSB) system 1 was overcooling during entry while operating on controller B. The lube oil overcooling observed after approximately 35 minutes of normal cooling at the 250 °F cooling point for lube oil return temperature. The lube oil temperature decreased to a minimum value of 177 °F. The crew switched to controller A; however, the temperature actually recovered several degrees by the time the controller switch was completed. The lube oil temperature returned to the nominal range within a few minutes of the switch to controller A. The total duration of the lube oil return temperature being below 250 °F was 11.25 minutes.

CONCLUSION: The auxiliary power unit (APU) system 1 is suspected to have contaminated its associated WSB system with hydrazine based on previous flight and confidence run data. The postflight lube oil sample contained excessive hydrazine and wax contamination. The hydrazine wax contamination and the associated effects to the heat transfer are a possible cause for or contributor to this anomaly. Another possible cause of the overcooling is intermittent hydraulic cooling which affected the lube oil cooling. WSB 1 did intermittently enter the hydraulic heat exchanger mode after the lube oil temperature began to decrease. It is a common occurrence for the lube oil temperature to decrease when intermittent hydraulic cooling is initiated; however, this overcooling occurred 62 seconds before the hydraulic bypass valve showed indications of movement to the hydraulic heat exchanger position. It is possible that some intermittent hydraulic cooling occurred before the bypass valve indicated movement; however, this theory cannot be verified with available data. **CORRECTIVE_ACTION:** The APU/WSB 1 system was hot oil flushed because of the postflight lube oil sample being unsatisfactory and the entry overcooling anomaly. The WSB checkout and servicing requirements have been successfully completed. A WSB/APU integrated study plan has been initiated with the goal of providing explanations of overcoolings and undercoolings. This problem is being tracked under CAR 45RF09-010.

EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

<u>Tracking No</u>	<u>Time</u>	<u>Classification</u>	<u>Documentation</u>		<u>Subsystem</u>
MER - 0	MET: 008:21:24:20.009	Problem	FIAR	IFA STS-45-V-11	APU
MMACS-03	GMT: 093:10:38:00.000		SPR 45RF10	UA	Manager:

Engineer:**Title:** APU 2 N2 Pressure Low (ORB)

Summary: DISCUSSION: During ascent and Flight Control System (FCS) checkout, the improved auxiliary power unit (APU) 2 gearbox GN2 pressure (V46P0251A) showed erratic pressure traces. This condition was first attributed to the relocation of the GN2 pressure transducer on the improved APU. But during entry, both the GN2 and lube oil out pressure (V46P0253A) were erratic and low. A few minutes after the APU was started, the GN2 pressure dropped to approximately 5.5 psi and the gear box was repressurized (command sent by the APU controller). Initially, both the GN2 and lube oil out pressures increased and become smoother. However, over the next 38 minutes the pressure slowly decreased and another repressurization occurred.

CONCLUSION: Postflight gearbox ullage verification indicated that the lube oil quantity was 150 cc lower than the quantity recorded preflight. Troubleshooting was performed with no problem found with the lube oil load or its documentation. No lube oil was found in the lube oil seal cavity. The most probable cause of the GN2 repressurization of the gearbox is a leak across the turbine seal allowing lube oil or GN2 to escape. The GN2 pressure transducer has been relocated near the suction side of the lube oil pump on the improved APU. This new location could be more sensitive to lube oil servicing/pump pressures near the low end of the lube oil quantity requirement compared to baseline APU's. CORRECTIVE_ACTION: Lube oil servicing has been completed for the next flight with all quantities within specifications. KSC has implemented a longer stabilization period during lube oil loading due to the new gearbox pressure transducer location. This new procedure will be effective for STS-46 and subs. A gearbox pressure decay test was performed post servicing with no leakage detected. Further investigation and analysis on the IAPU turbine seal will be followed under CAR 45RF10-010. EFFECTS_ON_SUBSEQUENT_MISSIONS: None

<u>Tracking No</u>	<u>Time</u>	<u>Classification</u>	<u>Documentation</u>	<u>Subsystem</u>
MER - 0	MET:	Problem	FIAR	IFA STS-45-V-12
None	GMT:		SPR 45RF07	UA
			IPR	PR PYR4-12-0150
				Manager:
				Engineer:

Title: EO-3 Hole Plugger Jammed (ORB)

Summary: DISCUSSION: The postflight inspection at KSC revealed that the debris plunger in the EO-3 (LO2) separation fitting debris container was caught by a booster cartridge and failed to seat properly. The other booster cartridge was found in the aft door drive mechanism and a connector backshell was missing from the canister.

CONCLUSION: The EO-3 (LO2) separation hole plugger was prevented from seating by the debris which lodged in its path during separation. The hole plugger partially accomplished its purpose; however several pieces of debris escaped outside of the containment canister. The hole plugger opening caused by the booster cartridge could have allowed the second booster cartridge to escape from the containment canister after External Tank (ET) door closure. However, the possibility exists that the booster cartridge escape before the plunger unsuccessfully seated and was in the umbilical cavity when the doors closed. CORRECTIVE_ACTION: Fly-as-is based on the following rationale: The interference with the hole plugger is a random occurrence depending on debris rebound velocity attenuation and direction. The probability of a fragment preventing ET-door closure is considered remote. The vehicle is moving away from any escaping debris during the ET separation phase. Any escaped debris must abruptly change direction perpendicular to the original trajectory and then make its way to the clevis/rod or door seal area to create a jam. A design modification to improve the Orbiter/ET separation debris containment system has been approved and has been implemented with CO-4050 dated 4/14/92.

EFFECTS_ON_SUBSEQUENT_MISSIONS: None.

<u>Tracking No</u>	<u>Time</u>	<u>Classification</u>	<u>Documentation</u>	<u>Subsystem</u>
MER - 0	MET:	Problem	FIAR	IFA STS-45-V-13
None	GMT:		SPR 45RF11	UA
			IPR None	PR
				Engineer:

Title: The SM Alert TIME/TONE audible alarm was intermittent. (ORB)

Summary: DISCUSSION: The flight crew reported that on several occasions during the flight there was no audible tone when the System Management (SM) Alert function was programmed for a time alert to provide a cue for initiation of maneuvers to the next payload pointing attitude. The anticipated Cathode Ray Tube (CRT) message and the annunciator light on Panel F7 were present in all cases. The SM system was used for this purpose approximately 200 times during the mission. The exact number of anomaly occurrences is unknown but is believed to be approximately five to ten times, with random spacing throughout the flight. The crew stated that the alert duration was set to one second and that there were no changes in configuration or procedures between events.

The SM Alert software process generates six tone commands which are transmitted through each of the four Flight Forward (FF) Multiplexer Demultiplexers (MDM) and two Payload Forward (PF) MDMs to the Caution and Warning Electronics where the inputs are cross-strapped to redundant SM tone generators, and subsequently routed to the communication audio system. Four additional commands are simultaneously sent through the FF MDMs, two of which proceed to Annunciator Control Assemblies No. two and three to drive the SM Alert light. KSC ran OMI procedure V1084.03 to check out the SM, siren, klaxon, and caution and warning tones. No problems occurred. CONCLUSION: The cause of this anomaly is presently unknown. The problem may be in the caution and warning hardware or in the comm hardware. The possibility of a software problem exists; however, this is the first report occurrence of this anomaly. CORRECTIVE_ACTION: No corrective action has been identified at this time. Investigation is continuing under hardware IM 45RF11. Software analysis is also ongoing. EFFECTS_ON_SUBSEQUENT_MISSIONS: Should the anomaly recur, SM Messages and the SM Alert light are still available to the crew. There is no evidence that this anomaly effects generation of the Caution and Warning tone (primary or backup), the siren, or the klaxon.
